

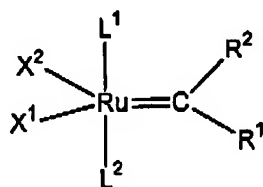
Application No.: 10/630,552

Docket No.: 09994-00019-US

**COMPLETE LISTING OF CLAIMS**

Claims 1-14 cancelled.

Claim 15 (Currently amended): A compound of the formula I,



I

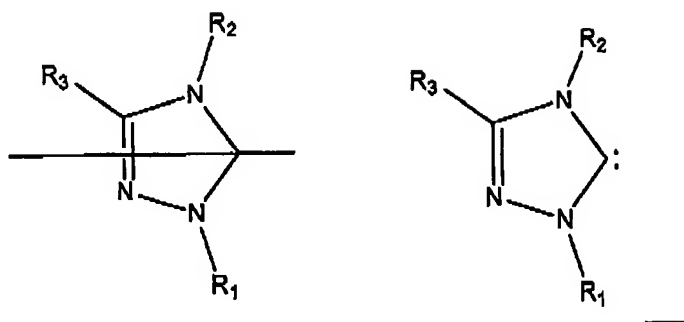
where  $\text{X}^1$  and  $\text{X}^2$  are identical or different and are each an anionic ligand,

$\text{R}^1$  and  $\text{R}^2$  are identical or different and are each hydrogen or a hydrocarbon group, where the hydrocarbon groups are identical or different and are selected independently from among straight-chain, branched, cyclic or noncyclic radicals from the group consisting of alkyl radicals having from 1 to 50 carbon atoms, alkenyl radicals having up to 50 carbon atoms, alkynyl radicals having up to 50 carbon atoms, aryl radicals having up to 30 carbon atoms and silyl radicals, or  $\text{R}^1$  and  $\text{R}^2$  ~~contain~~ forms a ring,

where one or more of the hydrogen atoms in the hydrocarbon or silyl groups or both the hydrocarbon and silyl group can be replaced independently by identical or different alkyl, aryl, alkenyl, alkynyl, metallocenyl, halogen, nitro, nitroso, hydroxy, alkoxy, aryloxy, amino, amido, carboxyl, carbonyl, thio or sulfonyl groups, the ligand  $\text{L}^1$  is an N-heterocyclic carbene of the formula IV and the ligand  $\text{L}^2$  is an uncharged electron donor,

Application No.: 10/630,552

Docket No.: 09994-00019-US



(IV)

where  $R_1$ ,  $R_2$  and  $R_3$  are identical or different and are each hydrogen or a hydrocarbon group, where the hydrocarbon groups comprise identical or different, cyclic, noncyclic, straight-chain or/and branched radicals selected from the group consisting of alkyl radicals having from 1 to 50 carbon atoms, alkenyl radicals having up to 50 carbon atoms, alkynyl radicals having up to 50 carbon atoms and aryl radicals having up to 30 carbon atoms, in which at least one hydrogen may be replaced by functional groups, and where  $R_3$  may additionally be halogen, nitro, nitroso, alkoxy, aryloxy, amido, carboxyl, carbonyl, thio or sulfonyl groups.

Claim 16. (Currently amended): The compound as claimed in claim 15, wherein at least one  $R^1$  and  $R^2$  is  ~~$C_1$ -alkyl~~ H, alkyl or aryl or  $R^1$  and  $R^2$  together form a ring.

Claim 17. (Previously Amended): The compound as claimed in claim 15, wherein some or all of the hydrogen atoms in the hydrocarbon groups  $R_1$ ,  $R_2$ , and  $R_3$  in the formulae IV replaced independently by identical or different halogen, nitro, hydroxy, alkoxy, aryloxy, amido, carboxyl, carbonyl, thio or sulfonyl.

Claim 18. (cancelled)

Claim 19. (Currently amended): The compound as claimed in claim 15, wherein  $R^1$  is hydrogen and  $R^2$  is phenyl.

Application No.: 10/630,552

Docket No.: 09994-00019-US

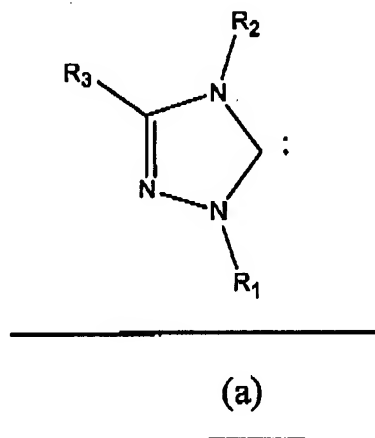
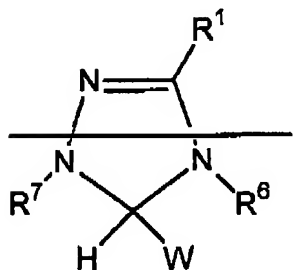
Claim 20. (Currently amended): The compound as claimed in claim 15, wherein  $L^2$  is ~~tricyclohexylphosphine or triphenylphosphine~~  $P(cyclohexyl)_3$ ,  $P(cyclopentyl)_3$ ,  $P(isopropyl)_3$ , or  $P(phenyl)_3$ .

Claim 21. (Previously Amended): The compound as claimed in claim 15, wherein  $X^1$  and  $X^2$  independently are halide, alkoxide or carboxylate ions.

Claim 22 (Previously Amended): The compound as claimed in claim 15, wherein  $X^1$  and  $X^2$  independently are halide.

Claim 23- 26 (Cancelled)

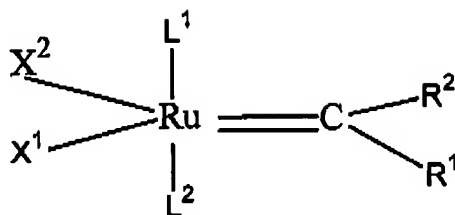
Claim 27. (Currently amended): A method for synthesizing the compound as claimed in claim 15, comprising contacting a compound of the formula (a)



with a compound of the formula

Application No.: 10/630,552

Docket No.: 09994-00019-US



wherein:

$\text{X}^1$  and  $\text{X}^2$  are either the same or different and are an anionic ligand;

$\text{R}^1$  and  $\text{R}^2$  are identical or different and are each hydrogen or a hydrocarbon group, where the hydrocarbon groups are identical or different and are selected independently from among straight-chain, branched, cyclic or noncyclic radicals from the group consisting of alkyl radicals having from 1 to 50 carbon atoms, alkenyl radicals having up to 50 carbon atoms, alkynyl radicals having up to 50 carbon atoms, aryl radicals having up to 30 carbon atoms and silyl radicals, or  $\text{R}^1$  and  $\text{R}^2$  contain a ring,

$\text{L}^1$  and  $\text{L}^2$  are either the same or difference and are neutral electron donor;

$\text{R}_1$ ,  $\text{R}_2$  and  $\text{R}_3$  are identical or different and are each hydrogen or a hydrocarbon group,

where the hydrocarbon groups comprise identical or different, cyclic, noncyclic, straight-chain or/and branched radicals selected from the group consisting of alkyl radicals having from 1 to 50 carbon atoms, alkenyl radicals having up to 50 carbon atoms, alkynyl radicals having up to 50 carbon atoms and aryl radicals having up to 30 carbon atoms, in which at least one hydrogen may be replaced by functional groups, and where  $\text{R}_3$  may also be halogen, nitro, nitroso, alkoxy, aryloxy, amido, carboxyl, carbonyl, thio or sulfonyl groups

Application No.: 10/630,552

Docket No.: 09994-00019-US

~~R<sup>6</sup> and R<sup>7</sup> are each independently hydrogen or a moiety selected from the group consisting of alkyl, alkenyl, alkynyl, aryl, carboxylate, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxy-carbonyl, alkylthio, alkylsulfonyl and alkylsulfinyl, wherein R<sup>6</sup> and R<sup>7</sup> are each independently substituted or unsubstituted; and W is selected from the group consisting of C<sub>1</sub>-C<sub>3</sub> primary alkyl oxides and wherein W is substituted or unsubstituted.~~

Claims 28 - 34 (cancelled)

Claim 35. (Previously Amended): The method of claim 27, wherein ~~X<sup>1</sup> and X<sup>2</sup>~~ are each independently selected from the group consisting of hydrogen, halogen, substituted moiety and unsubstituted moiety, wherein the moiety is selected from the group consisting of alkyl, aryl, alkoxide, aryloxy, alkyl-diketonate, aryl-diketonate, carboxylate, arylsulfonate, alkylsulfonate, alkylthio, alkylsulfonyl, and alkylsulfinyl, and wherein the moiety substitution is selected from the group consisting of alkyl, alkoxy, and aryl; and wherein X<sup>1</sup> and X<sup>2</sup> are identical or different and are each halide, pseudohalide, tetraphenylborate, perhalogenated tetraphenylborate, tetrahaloborate, hexahalophosphate, hexahaloantimonate, trihalomethanesulfonate, alkoxide, carboxylate, tetrahaloaluminate, tetracarbonylcobaltate, hexahaloferate (III), or tetrahalopalladate (II);

L<sup>1</sup> and L<sup>2</sup> are each independently selected from the group consisting of phosphine, sulfonated phosphine, phosphite, phosphinite, phosphonite, arsine, stibine, ether, amine, amide, imine,



Application No.: 10/630,552

Docket No.: 09994-00019-US

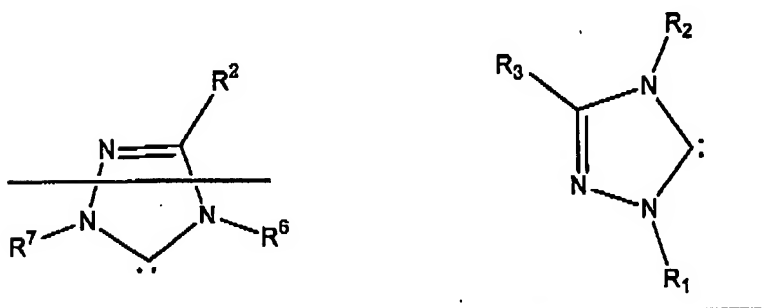
wherein

$X^1$  and  $X^2$  are either the same or different and are an anionic ligand;

$R^1$  and  $R^2$  are identical or different and are each hydrogen or a hydrocarbon group, where the hydrocarbon groups are identical or different and are selected independently from among straight-chain, branched, cyclic or noncyclic radicals from the group consisting of alkyl radicals having from 1 to 50 carbon atoms, alkenyl radicals having up to 50 carbon atoms, alkynyl radicals having up to 50 carbon atoms, aryl radicals having up to 30 carbon atoms and silyl radicals, or  $R^1$  and  $R^2$  contain a ring,

$L^1$  and  $L^2$  are either the same or ~~different~~ different and are neutral electron ~~donor~~ donors;

the N-heterocyclic carbene ligand is a triazolylidene ligand of the formula:



$R^6$  and  $R^7$  are each independently hydrogen or a moiety selected from the group consisting of alkyl, alkenyl, alkynyl, aryl, carboxylate, alkoxy, alkenyloxy, alkynyloxy, aryloxy, alkoxycarbonyl, alkylthio, alkylsulfonyl and alkylsulfinyl, wherein

$R^6$  and  $R^7$  are each independently substituted or unsubstituted

where  $R_1$ ,  $R_2$  and  $R_3$  are identical or different and are each hydrogen or a hydrocarbon group.

Application No.: 10/630,552

Docket No.: 09994-00019-US

where the hydrocarbon groups comprise identical or different, cyclic, noncyclic, straight-chain or/and branched radicals selected from the group consisting of alkyl radicals having from 1 to 50 carbon atoms, alkenyl radicals having up to 50 carbon atoms, alkynyl radicals having up to 50 carbon atoms and aryl radicals having up to 30 carbon atoms, in which at least one hydrogen may be replaced by functional groups, and where  $R_3$  may also be halogen, nitro, nitroso, alkoxy, aryloxy, amido, carboxyl, carbonyl, thio or sulfonyl groups.

Claim 44. (Currently amended) The method of claim 43, wherein  $X^1$  and  $X^2$  are each ~~independently selected from the group consisting of hydrogen, halogen, substituted moiety and unsubstituted moiety, wherein the moiety is selected from the group consisting of alkyl, aryl, alkoxide, aryloxy, alkylidenedione, arylidenedione, carboxylate, arylsulfonate, alkylsulfonate, alkylthio, alkylsulfonyl, and alkylsulfinyl, and wherein the moiety substitution is selected from the group consisting of alkyl, alkoxy, and aryl;~~  
wherein  $X^1$  and  $X^2$  are identical or different and are each halide, pseudohalide, tetraphenylborate, perhalogenated tetraphenylborate, tetrahaloborate, hexahalophosphate, hexahaloantimonate, trihalomethanesulfonate, alkoxide, carboxylate, tetrahaloaluminate, tetracarbonylcobaltate, hexahaloferate (III), or tetrahalopalladate (II) and

$L^1$  and  $L^2$  are each independently selected from the group consisting of phosphine, ~~sulfonated phosphine, phosphite, phosphinite, phosphonite, arsine, stibine, ether, amine, amide, imine, sulfoxide, carboxyl, nitrosyl, pyridine, and thioether;~~ and  $R^1$  is hydrogen and  $R^2$  is phenyl or  $R^1$  and  $R^2$  form a ring.



Application No.: 10/630,552

Docket No.: 09994-00019-US

Claim 45. (Previously Amended): The method of claim 44, wherein  $X^1$  and  $X^2$  are each chloride and  $L^1$  and  $L^2$  are each independently selected from the group consisting of  $P(\text{cyclohexyl})_3$ ,  $P(\text{cyclopentyl})_3$ ,  $P(\text{isopropyl})_3$ , and  $P(\text{phenyl})_3$ .

Claim 46. (Cancelled)

47. (New) In a process for olefin metathesis reaction wherein the improvement comprises using a catalyst which comprises the complex as claimed in claim 15.
48. (New) An olefin metathesis process which comprises reacting an olefin with at least one double bond in the presence of a catalyst wherein said catalyst comprises the complex as claimed in claim 15.
49. (New) A process for ring-opening metathesis polymer which comprises reacting an olefin with at least one double bond in the presence of a catalyst wherein said catalyst comprises the complex as claimed in claim 15.
50. (New) A process for ring-closing metathesis which comprises reacting an olefin with at least one double bond in the presence of a catalyst wherein said catalyst comprises the complex as claimed in claim 15.

Application No.: 10/630,552

Docket No.: 09994-00019-US

51. (New) A process for acyclic diene metathesis polymerization which comprises reacting an olefin with at least one double bond in the presence of a catalyst wherein said catalyst comprises the complex as claimed in claim 15.
52. (New) A process for depolymerization of an olefin polymer which comprises reacting an olefin with at least one double bond in the presence of a catalyst wherein said catalyst comprises the complex as claimed in claim 15.
53. (New) The compound as claimed in claim 15, wherein  $X^1$  and  $X^2$  are identical or different and are each halide, pseudohalide, tetraphenylborate, perhalogenated tetraphenylborate, tetrahaloborate, hexahalophosphate, hexahaloantimonate, trihalomethanesulfonate, alkoxide, carboxylate, tetrahaloaluminate, tetracarbonylcobaltate, hexahaloferate (III), or tetrahalopalladate (II).
54. (New) The compound as claimed in claim 15, wherein  $X^1$  and  $X^2$  independently are chloride.
55. (New) The method as claimed in claim 27, wherein  $X^1$  and  $X^2$  are identical or different and are each halide, pseudohalide, tetraphenylborate, perhalogenated tetraphenylborate, tetrahaloborate, hexahalophosphate, hexahaloantimonate, trihalomethanesulfonate, alkoxide, carboxylate, tetrahaloaluminate, tetracarbonylcobaltate, hexahaloferate (III), or tetrahalopalladate (II).

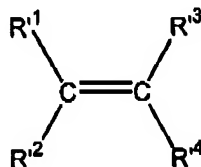
Application No.: 10/630,552

Docket No.: 09994-00019-US

Claim 56. (New): The compound as claimed in claim 15, wherein  $R^1$  and  $R^2$  together form a ring.

Claim 57. (New): The compound of claim 15, wherein  $R^1$  is hydrogen,  $R^2$  is phenyl, or  $R^1$  and  $R^2$  form a ring,  $R_1$  and  $R_2$  are each phenyl,  $L^1$  is  $P(\text{phenyl})_3$  or  $P(\text{cyclohexyl})_3$ , and  $X^1$  and  $X^2$  are each chloride.

Claim 58. (New) A process for preparing acyclic olefins having two or more carbon atoms or cyclic olefins having four or more carbon atoms, in each case of the formula VII



VII

from acyclic olefins having two or more carbon atoms or from cyclic olefins having four or more carbon atoms, in each case corresponding to the formula VII by an olefin metathesis reaction in the presence of at least one catalyst comprising the complex as claimed in claim 15 and  $R'^1$ ,  $R'^2$ ,  $R'^3$  and  $R'^4$  in the formula VII are hydrogen or hydrocarbon groups,

where the hydrocarbon groups are each selected independently from among straight-chain, branched, cyclic or noncyclic radicals of the group consisting of alkyl radicals having from 1 to 50 carbon atoms, alkenyl radicals having up to 50 carbon atoms, alkynyl radicals having up to 50 carbon atoms, aryl radicals having up to 30 carbon atoms, metallocenyl or silyl radicals, in which one or more hydrogens may be replaced by a functional group,

where one or more of  $R'^1$ ,  $R'^2$ ,  $R'^3$  and  $R'^4$  may independently be identical or different halogen, nitro, nitroso, hydroxy, alkoxy, aryloxy, amino, amido, carboxyl, carbonyl, thio, sulfonyl or metallocenyl groups.

535323

Application No.: 10/630,552

Docket No.: 09994-00019-US

59. (Original) The process as claimed in claim 58, wherein one or more double bonds are present in the olefins used.
60. (Previously Presented) The process as claimed in claim 58, wherein  $R'^1$ ,  $R'^2$ ,  $R'^3$  and  $R'^4$  in the olefins of the formula VII to be prepared form, in pairs, one or more identical or different rings.
61. (Previously Presented) The process as claimed in claim 58, wherein some or all of the hydrogen atoms in the hydrocarbon groups  $R'^1$ ,  $R'^2$ ,  $R'^3$  and  $R'^4$  of the olefins of the formula VII to be prepared are replaced independently by identical or different halogen, silyl, nitro, nitroso, hydroxy, alkoxy, aryloxy, amino, amido, carboxyl, carbonyl, thio, sulfonyl or metallocenyl groups.
62. The complex as claimed in claim 15, wherein  $L^1$  and  $L^2$  form a chelating ligand of the formula VI
- $$L^1-Y-L^2$$
- VI
- where the bridges Y comprise cyclic, noncyclic, straight-chain or branched radicals selected from the group consisting of alkylene radicals having up to 50 carbon atoms, alkenylene radicals having up to 50 carbon atoms, alkynylene radicals having up to 50 carbon atoms, arylene radicals having up to 30 carbon atoms, metallocenylene, borylene and silylene radicals in which one or more hydrogens may be replaced independently by identical or different alkyl, aryl, alkenyl, alkynyl, metallocenyl, halo,

Application No.: 10/630,552

Docket No.: 09994-00019-US

nitro, nitroso, hydroxy, alkoxy, aryloxy, amino, amido, carboxyl, carbonyl, thio or sulfonyl groups.

63. (New) A complex as claimed in claim 62, wherein the ligands of the formulae IV or VI have central, axial or planar chirality.
64. (New) A complex as claimed in claim 15, wherein  $R^1$  and  $R^2$  in the structural formula I are independently hydrogen, substituted or unsubstituted alkyl, alkenyl or aryl radicals,  $X^1$  and  $X^2$  independently are halide, alkoxide or carboxylate ions and  $L^1$  and  $L^2$  are each an N-heterocyclic carbene of the formula IV.